

## MHF4U: Functions

### Unit 1

#### Activity 2

### Comparison of Functions Worksheet

#### Part I

*To check your own work, go through the Multi Media Object again. All answers for Part I are contained there.*

#### Part II Summary

1. How many different kinds of end behaviours are there for:
  - a. Polynomial Functions: A limited number of end behaviours. Odd degree'd functions have different end behaviours for  $x \rightarrow \infty$  and  $x \rightarrow -\infty$ . Even degree'd functions have the same end behaviours for  $x \rightarrow \infty$  and  $x \rightarrow -\infty$ .
  - b. Exponential Functions: Every exponential function has opposite end behaviours for  $x \rightarrow \infty$  and  $x \rightarrow -\infty$ . But there are only two possibilities: the function increases or the function decreases.
  - c. Sinusoidal Functions: There are no end behaviours. The functions continue to repeat for both  $x \rightarrow \infty$  and  $x \rightarrow -\infty$ .
  
2. What is the maximum number of zeroes for:
  - a. Polynomial Functions: No maximum. It depends on the degree of the function.
  - b. Exponential Functions: Maximum of one zero, if graph cuts the x-axis.
  - c. Sinusoidal Functions: Infinite number of zeroes possible for any one sinusoidal function.
  
3. What is the maximum number of turning points for:

- a. Polynomial Functions: This depends on the degree of the polynomial. For a polynomial of degree two, there is at most one maximum or minimum, as there is only one turning point. A quartic polynomial function can have up to three turning points, and thus a total of three local maxima and minima.
- b. Exponential Functions: There is no local maximum or minimum for an exponential function. There are no turning points in this type of function. A given function will continually increase or continually decrease for all values of the domain.
- c. Sinusoidal Functions: An infinite number of turning points in any sinusoidal function, and thus an infinite number of local maxima and minima, each of which is also a global maximum or minimum.

4. How do the Domain and Range vary for:

- a. Polynomial Functions: Domain is  $x \in \mathbf{R}$  and Range is limited in one direction, if the degree is even (ie  $y \geq c$  or  $y \leq c$ ).
- b. Exponential Functions: Domain is  $x \in \mathbf{R}$  and Range is limited in one direction ie  $y > c$  or  $y < c$ , where  $y=c$  is a horizontal asymptote for the function.
- c. Sinusoidal Functions: Domain is  $x \in \mathbf{R}$  and Range is limited to values between an upper and lower bound, based on the amplitude of the wave form for the function.